SERVICE BULLETIN

Health Imaging Products

Eastman Kodak Company, Health Imaging, Rochester, NY 14650

SERVICE BULLETIN NO. 30

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Processing Recommendations
Kodak X-Omat PROCESSORS
Kodak X-Omat MULTILOADERS
Kodak Min-R MAMMOGRAPHY PROCESSORS

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Updates from Previous Version

New Information:

Kodak X-Omat BT FILM - processing information.
Kodak Min-R EV FILM - processing information
Kodak Ektascan EC/RA FILM - processing information
Revised M6B flooded recommendation

Information deleted or moved to other documents

Remove M8 recommendations (M8 is service discontinued)
Software Table has been moved to the new Analog Equipment Operating and Service Software CD p/n 6F2420
Remove the recommendations (discontinued, all product in field expired) for *the Kodak Min-R* M FILM

Purpose of Service Bulletin 30

- To document the current processing recommendations for the following Kodak Processors:
  - *Kodak* M35/M35A/M35-M/M35A-M *X-Omat* PROCESSORS*, Kodak X-Omat* M43/M43A PROCESSORS,
  - *Kodak X-Omat* CLINIC 1 PROCESSOR, *Kodak* RP *X-Omat* PROCESSOR, Model M7B/M7B-E/M6A-N/M6AW/M6B, *Kodak X-Omat* 270/3000 RA INTEGRATED PROCESSORS, *Kodak X-Omat* 180 LP/180 LPS PROCESSORS, *Kodak X-Omat* PROCESSOR, Model M6RA, *Kodak X-Omat* 460/480/5000 RA PROCESSORS, *Kodak X-Omat* 1000/1000A/1000J/2000/2000A PROCESSORS
  - *Kodak X-Omat* MULTILOADER 7000, and the *Kodak X-Omat* MULTILOADER 300/300 PLUS
  - *Kodak Min-R* MAMMOGRAPHY PROCESSOR
- To document the current processing recommendations for Kodak Medical Films with Kodak Processing Chemicals that are manufactured in the United States.

Notes:

- This data supersedes all previous replenishment information given in publications for *Kodak X-Omat* PROCESSORS and the *Kodak Min-R* PRODUCTS.
- **These guidelines should be used as an *initial starting point*, and may be changed as needed to satisfy specific site conditions and sensitometric objectives.**

Recommended Replenishment Rates

General Radiography, Laser Films, and Non-Dedicated Mammography

For Area Processors with Smart Replenishment

- *Kodak X-Omat* 270/3000 RA PROCESSORS, *Kodak X-Omat* 180 LP/LPS PROCESSORS, *Kodak X-Omat* 460/480/5000 RA PROCESSORS, *Kodak X-Omat* PROCESSOR, Model M6RA, *Kodak X-Omat* MULTILOADER 7000, and the *Kodak X-Omat* MULTILOADER 300/300 PLUS

- Smart Replenishment is enabled by default.
- Replenishment takes place after the equivalent area of a 35 x 43 cm (14 x 17 in.) film has been fed; therefore, replenishment rates must be set for a 35 x 43 cm (14 x 17 in.) film feed.
- Additional replenishment occurs automatically during low film usage.

Film Size Processed	Use Condition	Average Amount of 35 x 43 cm Equivalent Films per 8 hrs of Processor Operation	Replenishment Rates (ml per 35 x 43 cm)	
			Developer	Fixer
All	Any	Any number *	60	85
* Flooded replenishment should not be needed due to the automatic compensation for use, but it is available if needed to maintain sensitometry for very low use conditions.				

For Area Processors without Smart Replenishment

Kodak X-Omat M43/M43A/CLINIC 1 PROCESSORS

- RA PROCESSORS with Smart Replenishment turned off (special mammo feature enabled)

- The equivalent area of a 35 x 43 cm (14 x 17 in.) film is 1505 cm sq. (238 sq. in.).
- Replenishment takes place after the equivalent area of a 35 x 43 cm (14 x 17 in.) film has been fed; therefore, replenishment rates must be set for a 35 x 43 cm (14 x 17 in.) film feed.
- Replenishment rates need to be set for different usage conditions.

Film Size Processed	Use Condition	Average Number of 35 x 43 cm Equivalent Films per 8 hrs of Processor Operation	Replenishment Rates (ml per 35 x 43 cm)	
			Developer	Fixer
Equivalent to 35 x 43 cm	High	75 sheets or more	60	85
	Medium	25 - 75 sheets	80	100
	Low	25 sheets or less *	100	120
* If sensitometry does not stay within control limits, flooded replenishment may be needed.				

Recommended Replenishment Rates (continued)
General Radiography, Laser Films, and Non-Dedicated Mammography

For Length Processors

Kodak M35/M35A/M35M/M35A-M *X-Omat* PROCESSORS, *Kodak* RP *X-Omat* PROCESSORS, Model M7B/M7B-E/M6A-N/M6AW/M6B, M6R, *Kodak X-Omat* 1000/1000A/1000J/2000/2000A PROCESSORS, and the *Kodak Min-R* MAMMOGRAPHY PROCESSORS

- Replenishment takes place whenever film is in the entrance rollers.
- Replenishment rates must be set according to usage and film size(s) fed.
- Film should be fed as recommended in the Processor Operator Manual/User Guide.
- *Kodak* M35M, M35A-M *X-Omat* PROCESSORS and the *Kodak Min-R* MAMMOGRAPHY PROCESSORS are **not recommended** for roll film.

Film Size Processed	Use Condition	Average Number of Films per 8 hrs of Processor Operation	Replenishment Rates (ml per 35 x 43 cm)	
			Developer	Fixer
Roll 35 cm wide (only)	High	105 linear feet or more	50	70
	Medium	35 - 105 linear feet	65	85
	Low	35 linear feet or less *	80	100
35 x 35 cm (only)	High	90 sheets or more	50	70
	Medium	30 - 90 sheets	65	85
	Low	30 sheets or less *	80	100
Average size intermix	High	115 sheets or more	50	70
	Medium	40 - 115 sheets	65	85
	Low	40 sheets or less *	80	100
35 x 43 cm (only)	High	75 sheets or more	60	85
	Medium	25 - 75 sheets	80	100
	Low	25 sheets or less *	100	120

* If sensitometry does not stay within control limits, flooded replenishment may be needed.

Recommended Replenishment Rates
Dedicated Mammography

A Processor is considered dedicated if only single-emulsion film (mammography, ultrasound, etc.) is processed.
General purpose (non-dedicated) film should use the replenishment rates listed for general radiography (see previous section).
A list of current software is at the end of this bulletin.
Note: These guidelines should be used as initial starting points only.

For Area Processors with Smart Replenishment

- *Kodak X-Omat* 270/3000 RA PROCESSORS, *Kodak X-Omat* PROCESSOR, Model M6RA, *Kodak X-Omat* 460/480/5000 RA PROCESSORS
- *Kodak X-Omat* MULTILOADER 7000, and the *Kodak X-Omat* MULTILOADER 300/300 PLUS

- Smart Replenishment is enabled by default.
- The equivalent area of a 35 x 43 cm (14 x 17 in.) film is 1505 cm sq. (238 sq. in.).
- Replenishment takes place after the equivalent area of a 35 x 43 cm (14 x 17 in.) film has been fed; therefore, replenishment rates must be set for a 35 x 43 cm (14 x 17 in.) film feed.
- Additional replenishment occurs automatically during low film usage. This feature can be disabled by using software version 3.0 or higher. **Note:** 3000 RA and 5000 RA PROCESSORS have the ability to override this feature without installing new software.
- Refer to **"Conversion and Processing Instructions for MIN-R 2000 Film"** (formerly known as Service Bulletin 244) for additional information.

Film Processed	Use Condition	Average Number of Films per 8 hrs of Processor Operation	Replenishment Rates* (ml per 35 x 43 cm)	
			Developer	Fixer
MIN-R EV, MIN-R 2000	Smart Replenishment enabled (Not recommended)	260 sheets or more	90	105
		200 sheets	80	
		150 sheets	70	
		100 sheets	65	
		70 sheets	60	
		Less than 60 sheets	Flooded	Flooded
MIN-R L, MIN-R S	Any	Any number*	105	105
* Flooded replenishment is available if needed to maintain sensitometry for very low use conditions.				

For Area Processors with Smart Replenishment disabled

- *Kodak X-Omat* 270/3000 RA PROCESSORS, *Kodak X-Omat* PROCESSOR, Model M6RA, and the *Kodak X-Omat* 460/480/5000 RA PROCESSORS
- *Kodak X-Omat* MULTILOADER 7000, and the *Kodak X-Omat* MULTILOADER 300/300 PLUS

Film Processed	Use Condition	Average Number of 18 x 24 cm Films per 8 hrs of Processor Operation	Replenishment Rates* (ml per 35 x 43 cm)	
			Developer	Fixer
MIN-R EV, MIN-R 2000	Medium, High	60 sheets or more	90	105
	Low	60 sheets or less*	Flooded	Flooded
MIN-R L, MIN-R S	Medium, High	60 sheets or more	105	105
	Low	60 sheets or less*	Flooded	Flooded
* If sensitometry does not stay within control limits, flooded replenishment may be needed.				

Recommended Replenishment Rates (continued)
Dedicated Mammography

For Length Processors

- *Kodak* M35-M/M35A-M *X-Omat* PROCESSORS, *Kodak* RP *X-Omat* PROCESSOR, Model M7B/M7B-E/M6A-N/ M6AW/M6B/M6R
- *Kodak Min-R* MAMMOGRAPHY PROCESSORS

- Replenishment takes place whenever film is in the entrance rollers.
- Replenishment rates must be set according to usage and film size(s) fed.
- *Min-R* L and *Min-R* 2000 FILMS are fed **emulsion side down** in the *Kodak* M35-M, M35A-M *X-Omat* PROCESSORS and the *Kodak Min-R* MAMMOGRAPHY PROCESSORS.
- For the *Kodak* MINILOADER 2000P and the *Kodak X-Omat* MULTILOADER 700 docked to length-replenished processors, mammography rates are set using 18 cm film travel.

Film Processed	Film Feeding	Use Condition	Average Number of Films per 8 hrs of Processor Operation	Replenishment Rates (ml per 18 x 24 cm)**	
				Developer	Fixer
MIN-R EV MIN-R 2000	Single	Medium - High Low	60 sheets or more 60 sheets or less*	25 Flooded	30 Flooded
	Double	Medium - High Low	60 sheets or more 60 sheets or less*	50 Flooded	60 Flooded
MIN-R L MIN-R S	Single	Medium - High Low	60 sheets or more 60 sheets or less*	30 Flooded	30 Flooded
	Double	Medium - High Low	60 sheets or more 60 sheets or less *	60 Flooded	60 Flooded

* If sensitometry does not stay within control limits, flooded replenishment may be needed.
** Use a single 18 x 24 cm film to set the replenishment rates listed.

Recommended Replenisher Mixing

For best results, mix processing solutions between 70°F and 80°F (21.1°C and 26.7°C).
If using Replenisher Tank:

- Replenisher tank should be sized such that volume is approximately equal to or less than, the volume used in 2 weeks.
- Mix only in quantities large enough to be used in **2 weeks or less**.
- A floating lid **must** be installed in the developer/replenisher tank to reduce oxidation of the developer solution.

If using an Automixer without a floating lid:

- Mix only in quantities large enough to be used in **1 week**.
- Mix only when replenisher volume is near or at the low level alarm.

Note: Do not feed films into the processor during chemical mixing
For information on specific processors, refer to the "General Processor Information" at the end of this document.

Recommended Starter Volumes

Film	Environment	Developer	Starter (added to Processor Developer Tank)
MIN-R 2000	Dedicated MIN-R 2000	RP X-OMAT X-OMAT EXII	6 fl oz. (178 ml) per gallon
	Non-Dedicated MIN-R 2000	RP X-OMAT X-OMAT EXII	3 fl oz. (89 ml) per gallon
All Other	N/A	All (except RA/30)	3 fl oz. (89 ml) per gallon
		X-OMAT RA/30	No Starter Added

Recommended Processor Maintenance Timing

- Drain, clean, and refill the developer and fixer processing tanks monthly or as experience indicates.
- Specific site conditions may dictate more or less cleaning.
- Follow the maintenance instructions and safety procedures specified in the processor's Operator Manual/User Guide and Service Manual.
- Be sure to follow all environmental regulations when disposing of processing solutions.

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Reduced Replenishment Rate Recommendations

It may be possible to reduce the developer replenishment rate by up to 40% by using the *Kodak X-Omat* EX II DEVELOPER AND REPLENISHER, *Kodak* RP *X-Omat* DEVELOPER AND REPLENISHER, or the *Kodak X-Omat* RA/30 DEVELOPER AND REPLENISHER with the *Kodak T-Mat* FILM, *Kodak X-Sight* FILM, or the *Kodak Insight* FILM.

For more information, refer to the **"Chemistry Matters Optimization Guide"** (Pub M6-408, Catalog 1491109) and/or contact Kodak's Health Imaging Group at the telephone numbers listed on the last page.

Flooded Replenishment Rate Recommendations

- For low use rates, if sensitometry does not stay within control limits, flooded replenishment may be needed to maintain the developer solution at a continuously fresh chemical activity. This is accomplished by replenishing not only when film is fed or area accumulated, but also on the basis of additional replenishment added during the processor on-time with an automatic replenishment timing system.
- When in the flooded mode, developer starter is added to the replenishment tanks at a rate of 89 ml per gallon or 25 ml per liter (3 fl oz per gallon) for all films **except *Kodak Min-R* 2000, or when RA/30 Chemicals are used**.
- For *Kodak Min-R* 2000 FILM, developer starter is added to the replenishment tank at the rate of 118 ml per gallon or 33 ml per liter (4 fl oz per gallon).
- No starter is used for the *Kodak X-Omat* RA/30 DEVELOPER.
- For detailed information on how to set up each processor for flooded replenishment, see the appropriate service publication for that processor.
- Qualified service personnel should do the processor setup.
- When filling the developer replenishment or processor tank, add starter according to the table below.

KODAK Developer	Flooded Mode	Add Starter?	
		Replenishment Tank	Processor Tank
X-OMAT EX II	No	No	Yes
	Yes	Yes	No*
RP X-OMAT	No	No	Yes
	Yes	Yes	No*
Medical X-ray	No	No	Yes
	Yes	Yes	No*
X-OMAT RA/30	No	No	No
	Yes	No	No
* Fill the processor tank with chemistry that was mixed in the replenishment tank.			

➢ For All Kodak Processors except *Kodak X-Omat* 1000/1000A/1000J/M43/M43A/CLINIC 1 PROCESSORS and the *Kodak* RP *X-Omat* PROCESSOR, Model M6B

- Initially set the developer and fixer replenishment rates at 65 ml per 35 x 43 cm film. This amount will be fed into the processor every 5 minutes.
- Once set, the rate may be changed depending on the individual circumstances.
- Monitoring the processor sensitometry is required to change replenishment rates.
- Use the following recommendations as replenishment rates are reduced:
  1. Monitor sensitometry (speed and contrast).
  2. Reduce developer and fixer replenishment rates by 5 ml.
  3. Monitor sensitometry for 2 weeks.
  4. If no change is seen, rates may be reduced by another 5 ml.
  5. Once a change is seen, increase the developer and fixer rates by 5 to 10 ml.

➢ For *Kodak X-Omat* 1000/1000A/1000J PROCESSORS

- Initially set the regular developer and fixer replenishment rates at 100 ml per 35 x 43 cm film.
- Set the flooded replenishment rate at one-half of the above amount. The processor will feed the one-half amount (in this case, 50 ml) into the processor every 20 minutes.
- Monitoring the processor sensitometry is required to reduce replenishment rates.
- Use the following recommendations as replenishment rates are reduced:
  1. Monitor sensitometry (speed and contrast).
  2. Reduce developer and fixer replenishment rates by 5 ml.
  3. Monitor sensitometry for 2 weeks.
  4. If no change is seen, rates may be reduced by another 5 ml.
  5. Once a change is seen, increase the developer and fixer rates by 5 to 10 ml.

Flooded Replenishment Rate Recommendations (continued)

- **For the *Kodak X-Omat* M43/M43A/CLINIC 1 PROCESSORS**

  - Set the flooded replenishment rate at 100 ml for developer and 120 ml for fixer.
  - The processor delivers these volumes every 24 minutes to maintain sensitometry.
  - **Do not reduce these rates**.
  - Monitoring the processor sensitometry is required.

- **For the *Kodak* RP *X-Omat* PROCESSOR, Model M6B**

  - Set the flooded replenishment rate at 105 ml for 35 x 43 cm.
  - The processor will deliver these volumes every time the processor comes out of standby, to maintain sensitometry.
  - Monitoring the processor sensitometry is required.

Recommended Ventilation Requirements

- The processing area should have 10 air changes per hour, 24 hours per day, 7 days per week.
  For example, a 10 x 10 x 10-foot room has a volume of 1000 cubic feet, so the ventilation system should supply the room with 10,000 cubic feet of fresh air per hour, 24 hours per day, 7 days per week.
- For through-the-wall installations, the air pressure in the darkroom area where the processor is located must be of slightly higher pressure than the surrounding rooms to assure that the airflow through the processor is in the correct direction.
- For processor exhaust ventilation requirements, refer to Service Bulletin 101 and the appropriate service publication for the processor.

Adjusting the Dryer Temperature

- Use the lowest possible dryer temperature that will maintain proper film drying.
- Drying requirements vary depending on the processing cycle, the room temperature, ventilation and relative humidity, film type, and throughput. Adjust dryer temperature to meet individual site conditions.
- Different processing cycles require different dryer temperatures to compensate for the varying times the film is in the dryer section.
- Refer to the processor Operator Manual/User Guide for instructions.

Recommended Film Types vs. Processing Cycle

The following chart summarizes which films can be processed in which processor and at which processing cycle.

K = K/RA (Kwik) Cycle, using X-OMAT RA/30 Chemicals
S = Standard Cycle, using RP X-OMAT, X-OMAT EX II, Medical X-ray Chemicals
R = Rapid Cycle, using RP X-OMAT, X-OMAT EX II, Medical X-ray Chemicals

NA = Not Applicable
NR = Not Recommended

Note: Medical X-ray Developer is **not recommended** for use with *Kodak Min*-R FILMS.

Kodak Film	**Kodak Processor**							
	M7B M7B-E M6A-N M6AW M6B M6R	M35-M, M35A-M	M35 M35A M43 M43A Clinic 1	270 RA 3000 RA XML 300 XML 300Plus M6RA 460 RA 480 RA 5000 RA XML 7000	180 LP 180 LPS	1000 1000A 1000J	2000 2000A	MIN-R MIN-R I Mammo Processors
Available Cycles →	S	S	S	S R K	R	S	S R	S R
T-MAT RA Films	S	S	S	S R K	NA	S	S R	S R
INSIGHT Films	S	S	S	S	NA	S	S	S
X-SIGHT RA Films	S	S	S	S R K	NA	S	S R	S R
X-OMAT BT	S	S	S	S	NA	S	S	S
MIN-R EV	S	S	NR	S R	NA	NR	NR	S R
MIN-R 2000 MIN-R L MIN-R S	S	S	NR	S	NA	NR	NR	S
RA Duplicating	S	S	S	S R K	NA	S	S R	S R
EKTASCAN B/RA EKTASCAN C/RA	S	S	S	S R K	NA	NR	S	S R
EHN/EHNC	S	S	S	S R	R	NR	S	NR
EIR/EIRC, HQB	S	S	S	NA	NA	NR	S	NR
All Other Films	S	S	S	S	NA	S	S	NR

General Processor Information

NA = Not Applicable (starter not needed for K/RA cycle)

NC = Not Controlled (temperature)

NR = Process Not Recommended for this film type

Note: Starter Volume for *Kodak Min-R* FILM assumes a dedicated environment. If non-dedicated, use "All Other Film" info.

Processor Model	Cycle	Approx Devl Tank Volume	Starter Volume		Temperature			Transport Speed	Capacity 35 x 43 cm (18 x 24 cm)	Approx Devl Time	Approx Drop Time** 35cm length (24cm length)
			All Other Film	MIN-R 2000 Film	Devl	Fixer*	Water				
		gal (L)	fl oz (ml)	fl oz (ml)	°F (°C)	°F (°C)	°F (°C)	in./min (cm/min)	films/hr	seconds	seconds
M35 M35A	S	2.25 (8.3)	6.5 (190)	N/R	92° F (33.3° C)	NC	40° - 85° F (4° - 29.4° C)	30 (76.2)	94	33	150
M35-M M35A-M				13 (380)					94 (145)	33	150 (135)
2000 2000A	S	2.25 (8.3)	6.5 (190)	13 (380)	92° F (33.3° C)	NC	40° - 85° F (4° - 29.4° C)	30 (76.2)	94	33	150
	R			NR	94° F (34.4° C)			40.1 (101.6)	126	25	112 (101)
MIN-R	S	2.25 (8.3)	6.5 (190)	13 (380)	92° F (33.3° C)	NC	40° - 85° F (4° - 29.4° C)	30 (76.2)	94	33	150
	R				94° F (34.4° C)			40.1 (101.6)	126	25	112 (101)
M43, M43A Clinic 1	S	2.3 (8.7)	6.5 (190)	NR	93° F (33.9° C)	NC	40° - 85° F (4° - 29.4° C)	24 (61.0)	90	27	127
M7B M7B-E	S	2.25 (8.3)	6.5 (190)	13 (380)	94° F (34.4° C)	NC	40° - 85° F (4° - 29.4° C)	42 (106.7)	146 (250)	27	120 (116)
3000 RA 270 RA XML300 XML300+ XML7000	S	2.25 (8.3)	6.5 (190)	13 (380)	94° F (34.4° C)	90° F (32° C)	40° - 85° F (4° - 29.4° C)	42 (106.7)	148 (250)	26	111 (104)
	R		6.5 (190)	NR	99° F (37.2° C)	95° F (35° C)		57 (144.8)	201	19	82
	K		NA	NR	96° F (35.6° C)	90° F (32° C)		76 (193.0)	270	14.5	62
M6A-N M6AW M6B M6R	S	2.8 (10.7)	Molded: 8.5 (250) Stainless: 8 (237)	17 (500)	95° F (35° C)	NC	M6A-N: 85° - 90° F (30°-32.2°C) M6AW, M6B: 40° - 90° F (4° - 32.2° C)	66 (167.6)	229 (393)	25	90 (86)
M6RA 460 RA 480 RA 5000 RA	S	2.8 (10.7)	8.5 (250)	17 (500)	95° F (35° C)	95° F (35° C)	40° - 85° F (4° - 29.4° C)	66 (167.6)	233 (393)	24	95 (89)
	R		8.5 (250)	NR	101° F (38.3° C)			99 (251.5)	351	16	60
	K		NA	NR	98° F (36.6° C)			132 (335.3)	480	11	45
180 LP 180 LPS	R	2.25 (8.3)	6.5 (190)	NR	100° F (37.8° C)	100° F (37.8° C)	40° - 90° F (4° - 32.2° C)	63 (160.0)	180	18	79
1000 1000A 1000J	S	1.0 (3.8)	3.0 (90)	NR	95° F (35° C)	NC	40° - 85° F (4° - 29.4° C)	17 (43.2)	50 (84)	43	173

* Fixer temperature may exceed value listed due to internal ambient temperatures in the processor.

** Drop Time is defined as the time from the Lead Edge In (LEI) to the Trail Edge Out (TEO) for a 35 x 43 cm film. ( ) represents 18 x 24 cm LEI/TEO.

For more information, contact Kodak's Health Imaging Division:
800-328-2910 (U.S. Only)
651-393-1728 (Outside U.S.)

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